REMARKS

This Response is in reply to the Office Action dated April 4, 2003. Applicants note that the voluminous rejection of the previous Action has not been repeated and that a new rejection based on a combination of the Raether and Kahlbaugh et al. references has been made. In the Examiner's remarks, the Examiner comments on a very small portion of Applicants' comments relating to the nature of the media layer. With this in mind, Applicants understand that the rejections in this letter dated 4 April 2003 constitute the outstanding rejections in this Action and that the previous rejections have been subsumed by the arguments made therein.

In paragraph 1 of the Action, the Examiner comments on Applicants' position regarding the Kahlbaugh et al. coarse separation layer. In large part, the Examiner's argument is that the coarse separation layer in Kahlbaugh et al. is:

> ... a filtration layer since it will capture about 10 percent of the particulate matter that enters it. Furthermore, the Examiner notes that the support layer of Kahlbaugh et al. '399 satisfies the structural limitations used by Applicants to define a support layer as a filtration layer.

First, the Examiner's position is based on, Applicants assert, an unfair reading of Kahlbaugh et al. The ranges in Kahlbaugh et al. are extreme ranges which would not be used in a real structure combining both fine fiber and substrate. While theoretically a reduced efficiency layer of fine fiber could be used with an increased efficiency substrate layer, in practice, such would not be selected because the Kahlbaugh et al. structures are engineered to obtain filtration from the fine fiber layer and support and particle storage from the separation layer with little or no efficiency and very high permeability in the separation layer. Accordingly, the Examiner's position that the substrate layer in a real device efficiency could be as high as 10% is not well taken, since one of ordinary skill in the art would look at Kahlbaugh et al. and recognize immediately that using a quality fine fiber layer that the separation layer efficiency would be minimized as much as possible, while the efficiency of the fine fiber layer would be maximized. This position by the Examiner raises the question what it means to be a "filtration" component. In a broader sense, any aspect of a structure may be a "filtration" component since it appears in a filtration structure. In that sense, a cartridge, housing, valve, passageway, flexible seal, or other

element is a "filtration" material since it appears in a filtration structure such as that shown in the Kahlbaugh et al. reference. That does not mean, clearly, that the elements of a filtration apparatus acts to remove particulate from an air stream as a "filtration layer does". Applicants assert that any reading of Kahlbaugh et al., as a whole, shows that the Kahlbaugh et al. reference does not use the coarse separation layer to remove particulates from the air stream, but is simply there to act as a separation layer, as a component of the depth media and to act as a place for holding particulate removed by the fine fiber layers. Further, any layer that removes 10% or less of particulate cannot be considered a "filtration layer" since the removal of such a small amount of material cannot, in any substantial way, by itself, filter any effective amount of materials. An active filtration layer, acting alone, must have substantially higher filtration properties for most applications. A 10% or less efficient layer would have application only in a structure including, as in Kahlbaugh et al., a fine fiber layer that removes greater than 90% of the material from a moving air stream. The 10% or less efficiency of the separation layer adds essentially nothing to such a structure in terms of filtration efficiency. The coarse, non-woven, support layer in Kahlbaugh et al. separates fine fiber layers in the Kahlbaugh et al. structure and acts as a depth media.

The Examiner focuses narrowly on a small portion of Kahlbaugh et al. and ignores the reference taken as a whole. The Examiner understands that in an obviousness reference, one of ordinary skill in the art reads Kahlbaugh et al. reference as a whole and then considers what this combination teaches to one of ordinary skill in the art without reference to the claimed invention or the Applicants' disclosure. The Kahlbaugh et al. reference, taken as a whole, suggests that the support layer is, at best, minimally a filtration layer and when used in its preferred mode, has essentially no filtration properties and is simply there as a spatial layer to accumulate particulate in a **depth** filtration mode. Accordingly, the Examiner's comments about Kahlbaugh et al. disclosing some minimal filtration properties is substantially less relevant than the overall meaning of the Kahlbaugh et al. reference.

The Examiner has rejected claims 1-8 and 45-49 under 35 U.S.C. § 103 (a) are Raether in view of Kahlbaugh et al. Applicants respectfully traverse.

Applicants assert that the Examiner suggests that Kahlbaugh teaches a separation layer that has an efficiency of up to 10% and a permeability of greater than 150 $m\text{-}min^{-1}$. Applicants do not agree with this characterization but have amended the claims to differentiate Kahlbaugh

(the amended claims recite an efficiency greater than 11%). The claimed structure has an efficiency greater than the maximum efficiency of the reference and is patentable over Kahlbaugh since Kahlbaugh cannot be understood to include within its teaching a structure having all the limitations of the claim and the recited efficiency. Support for the amendment is found at page 53-55, in the tables of data showing substrate at 11% efficiency.

In order to obtain a *prima facie* case of obviousness, three basic criteria must be met:

(1) there must be some suggestion or motivation to combine references;

(2) there must be a reasonable expectation of success; and

(3) prior art references must teach or suggest all claim limitations.

In summary, Applicants assert that the Raether and Kahlbaugh et al. references are not combinable as they would be understood by one of ordinary skill in the art and further, there is no reasonable expectation of success. They are not combinable since the references relate to filtration designs that work differently by using different designs. Success cannot reasonably be expected since the use of a high efficiency separation layer in the context of Kahlbaugh would suggest a unacceptable loss of permeability in the overall structure.

Applicants assert that the Kahlbaugh reference (a **depth loading media, see Fig.** 7) cannot be used to teach a filter structure used in a **pulse-cleaned structure using a surface loading** construction. The claimed pulse cleaned structures use a pulse of air to remove the accumulated dust cake from the surface of the filter structure. Such a cleaning method is possible only if the filter surface accumulates dust on the surface. Depth loading structures cannot efficiently be cleaned by pulse cleaning methods since the dust is held within into the interior of the coarse separation layer between the fine fiber layers. The use of a Kahlbaugh material in a claimed filter is not obvious since **a skilled engineer would not use a depth media in a pulse-cleaned structure and in fact would harm the operation of the system in a pulse-cleaning mode.** Kahlbaugh, at Col. 25, lines 20-26 and at Col. 26, line 26 to Col. 27, line 32, teach that the structure is a depth structure.

Applicants further point out that the claimed structure uses a filter structure having a layer of filter media having **substantial filtration properties (efficiency greater than 11%)** with a fine fiber layer. Regarding the teachings of the Kahlbaugh et al. reference, the Examiner appears to conclude from the reference at Col. 14, line 63 to col. 15, line 6, that the reference teaches a support with substantial filtration properties. Applicants reiterate their position that the

Kahlbaugh et al. reference, taken as a whole, suggests that a coarse support layer is used to act as a support for the formation of the fine fiber layers. This coarse support media has little or no filtration properties. Further in the Kahlbaugh context, the coarse media cannot have substantial filtration properties and maintain useful filtration properties in the overall structure. The portion quoted by the Examiner on page 3, last full paragraph, appears in its complete form in the patent, shown below. Applicants believe that the Examiner has inadvertently mischaracterized the recitation. The full quotation is as follows:

> a. It is preferred to select a material which has a very low percentage solidity and a very high permeability, if possible, to enhance the "void space" across which the fine fiber web will extend. A material which has a filtering efficiency of only about 10% or less, typically 5% or less and preferably only 1-4%, for trapping 0.78 micron particles according to the test described herein, sometimes referred to as LEFS efficiency, will be preferred. Preferably it is a material having **a single layer permeability when evaluated by the Frazier Perm Test, of at least 150 meters/min, typically at least about 200-450 meters/min**. (Column 14, line 63 through Column 15, line 6, Bold supplied)

In the preceding paragraph, the recitation establishes an absolute floor on the permeability of this material. This recitation does not teach "substrate layer having a permeability of 150 meters/min..." This recitation clearly indicates that preferably the permeability of the material is **substantially greater than the lower limit recited**. This portion when read with the reference as a whole shows that the coarse separation layer cannot be understood to have any substantial filtration properties. The reference, taken as a whole, teaches the use of a substrate material having a much, much higher permeability and lower efficiency consistent with Applicants' prior arguments.

In order to have a complete understanding of the reference as a whole, the following listing is the substance of the disclosure in the Kahlbaugh reference regarding the nature of this coarse material from selected portions of Kahlbaugh et al., U.S. Patent No. 5,672,399:

Location	Quotation
Front Page, paragraph [57], under ABSTRACT	A preferred filter media, comprising multiple layers of fine fiber media separated **by coarse fiber support**, is provided.
Column 3, lines 35-37	A preferred filter media construction according to the present invention includes a first layer of **permeable coarse fibrous media having a first surface.**
Column 11, lines 52-58	A general approach for the utilization of fine fibers, i.e. on the order of 8 or 10 microns or less in diameter, preferably 5 microns or less and typically about 0.1 to 3.0 microns in **diameter (average), in filter media has been developed. In general, a very porous, permeable substrate of relatively coarse fibers is used as a support, for the very fine fiber** media.
Column 12, lines 6-9	That is, the media comprises a web of fine fibers on at least one outer surface of **a structure of coarse fibers. The fine fibers in the web of fine fibers, then, are not mixed in or entangled with the coarse fiber support**.
Column 13, lines 47-51	From the above it will be apparent that many typical filter media constructions according to the present invention, when configured for use to filter, will include multiple layers of media, with at least two layers effectively comprising a **coarse framework supporting fine fibers or a fine fiber web.**
Column 14, lines 4-7	Construction 10 includes a layer or region 13 of media comprising a **coarse support 14 having a thin layer** 15 of fine fibers on a surface thereof.
Column 14, lines 21-24	It comprises a stack of layers of fine fibers, each of which is spaced from the next adjacent fine fiber **layer by a coarse separating or support layer**.
Column 14, lines 28-34	Again, there is no requirement that the fine fiber layers be identical to one another, or that the various **coarse support layers be identical to one another. By "discrete"** ... each fine fiber layer is not substantially entangled with the **separating coarse support fibers, but** rather each fine fiber layer generally sits on a surface of a support structure.

Column 14, lines 36-47	**A principal function of the coarse material in filter media layers according to the present invention is to provide for a framework across which the fine fibers are extended. Another principal function of the coarse material is to provide for spacing between the regions or layers of fine fibers, in the stack, so that the separated layers of fine fibers do not collapse into a relatively dense (i.e. low permeability and relatively low loading) construction. The coarse support/spacing structure is not typically provided to serve any substantial filtering function. Indeed, it preferably is a material so open and permeable that it does not serve any substantial filtering function.**
Column 14, lines 63-66	**a. It is preferred to select a material which has a very low percentage solidity and a very high permeability,** if possible, to enhance the "void space" across which the fine fiber web will extend.
Column 14, line 66 through Column 15, line 3	A material which has a filtering efficiency of only about 10% or less, typically 5% **or less and preferably only 1-4%, for trapping 0.78 micron particles** according to the test described herein, sometimes referred to as LEFS efficiency, will be preferred.
Column 15, lines 3-6	Preferably it is a material having a single layer permeability when evaluated by the Frazier Perm Test, **of at least 150 meters/min, typically at least about 200-450 meters/min.**
Column 15, 47-50	In addition, it is an advantage **that the coarse support can be provided from readily available fibrous material such as** polymeric fibers.
Column 15, lines 50-51	Thus, commercially available materials can be chosen **as the coarse support or scrim.**
Column 15, lines 52-54	d. The material from which **the coarse support is formed** should be one to which the fine fibers can be readily and conveniently applied.

Column 16, lines 10-17	In general, it is believed that commercially available **fibrous scrims can be used as the coarse support. One such scrim is Reemay 2011, commercially available from Reemay Co. of Old Hickory, Ind. 37138. In general, it comprises 0.7 oz., spunbonded polyester.** **Alternatively, Veratec grade 9408353, spun bonded polypropylene material, from Veratec, Walpole, Mass. 01081, is usable.**
Column 16, lines 25-28	a. It should be a material that can be readily formed into fibers with the relatively small diameter selected, for application to **the coarse support, or** into a web or network of such fine fibers.
Column 16, lines 32-33	c. It should be a material which can be readily applied to the **coarse support.**
Column 16, lines 40-45	It is foreseen, however, that similar techniques and webs, applied **to coarse support structures** as described herein, and used in stacked arrangements as described herein, would comprise appropriate and useable applications of the present invention.
Column 16, lines 65-66	The fine fibers can be **secured to the coarse support in a** variety of manners.
Column 17, lines 31-35	In general, from the above it will be apparent that a layer of media used in constructions according to the present invention will generally **include a coarse support** having a layer or web of fine fibers secured to at least one surface thereof.
Column 18, lines 24-29	It is foreseen that in typical, preferred constructions having fine fiber diameters of about 0.1 to 5.0 microns, the mass of material from which the fine fibers are formed, **applied per unit surface area of scrim or coarse support, will be within the range of about 0.2 to 25 g/m^2**, regardless of the particular material used.
Column 18, lines 30-35	An alternate method to characterize a typical and preferred media layer in constructions according to the present invention is with respect to the amount of interfiber space open or visible, when looking into **the coarse fiber support** or scrim (from the fine fiber side), that is occupied by or covered the fine fibers or web of fine fibers.

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Column 18, lines 41-43	**The coarse support comprises polyester fibers of 25 to 35 microns in diameter. The fine fibers generally comprise glass fibers from about 0.1 to 3 microns in diameter.**
Column 19, lines 3-14	In general, **if a coarse fiber support** structure comprising fibers having an average diameter of at leas 10 microns, and also having an efficiency of 6% or less, for 0.78μ particles when evaluated as described herein, is improved by application of at least one fine fiber layer thereon, wherein the fine fibers have an average fiber diameter of about 5 microns or less, such that the improved material when tested has an efficiency of at least about 8%, and preferably at least 10%, for the 0.78μ particles defined, the construction will be one which has at least some of the desirable properties for use in at least certain preferred arrangements according to the present invention.
Column 27, lines 33-35	**M. Positioning of the Fine Fiber on the Coarse Support; Orientation of the Fine Fiber Layer with Respect to Fluid Flow**
Column 30, lines 30-32	In those instances the media comprised a layer of glass microfibers on a porous **polyester scrim (Reemay 2011).**
Column 30, lines 34-36	The coarse scrim generally comprised the polyester scrim described above, commercially available **under the designation Reemay 2011.**
Column 34, lines 11-15	For instance, if a composite had an LEFS efficiency of 50% and was made of 6 layers, each layer **(Reemay 2011** substrate with fine fibers thereon) would have an LEFS efficiency of 10.9%.
Column 39, lines 46-49	**It comprises DCI polymeric fine fiber deposited on Reemay 2011, depicted at 100-fold magnification. The media depicted had a percent efficiency of 12% LEFS.**

The portions shown above disclose a layer between fine fiber that is a course layer for "support/spacing" (Col. 14, lines 36-47) functions not to add filtration properties to the structure. The portion that discusses permeability and efficiency (Col. 14, line 63 to Col. 15 line 6) indicates that the **permeability is to be maximized** while the **efficiency is kept to a minimum**.

Applicants challenge the Examiner's position that the reference teaches that the support has a "permeability of 150 m/min (2.5 m/sec) and an efficiency of 10 percent ..." (page 3, the last

paragraph). These parameters are extreme limits of the ranges in the patent. In use, the materials disclosed will not simultaneously possess these extreme layer characteristics. In a real material that is optimized for both high permeability and low efficiency, these extreme limits could not be reached and would not be used by one skilled in the art.

The Reemay 2011 scrim material that is used as a coarse support material in the exemplary section of Kahlbaugh et al. is a material made by spinbonding polyester fiber. The Reemay scrim has a very low efficiency on standard 0.8 micron polystyrene particles typically less than 4% with a high permeability of 1070 ft./min (326 m/min). Attached to this letter is a copy of product specification (Attachment 1) materials discussing the nature of Reemay 2011 scrim showing that it is deliberately chosen not to have filtration properties, particularly when compared to other non-woven materials made by the same vendor having substantially higher filtration properties. The Reemay scrim is selected for its structural support and separation characteristics not its filtration characteristics.

Kahlbaugh et al. show a substantially different technology than that claimed. Kahlbaugh et al. discloses a unique filter laminate that is unrelated to the claimed invention. Kahlbaugh et al. discloses a structure designed to operate efficiently with multiple layers of fine fiber separated by coarse non-filtration support layer having little or no filtration properties. The overall filtration efficiency of the materials claimed is substantially degraded if a layer of media with substantial filtration properties is inserted into the Kahlbaugh et al. structure. The claimed invention uses a cooperation between a filter medium layer and two or nor fine fiber layers to obtain filtration properties. Any random substitution of layers in the Kahlbaugh et al. structure would likely not result in a useful filter structure.

Raether and Kahlbaugh et al. are not logically combinable. Kahlbaugh et al. is a depth media using a coarse separation layer separating multiple fine fiber layers. At best, Raether teaches a single flat or pleated media layer and teaches nothing about combining that single media layer with any other layer for any purpose. As such, since the active filtration materials in Raether and Kahlbaugh et al. are so extraordinary different, one of ordinary skill in the art would not combine these references for any purpose. Further, since the utilities of Raether and Kahlbaugh et al. are so substantially different, one of ordinary skill in the art would not combine them for any purpose.

There is no reasonable expectation of success apparent on the face of these references. The Kahlbaugh et al. reference clearly states that the separation media has little or no filtration properties. In a structure such as Raether, modifying Raether with the structure of Kahlbaugh et al. and including in that structure, an effective filtration media in contact with a fine fiber would result in a substantially inoperative structure, since the combination of efficiencies of the fine fiber and the media would result in such a low permeability that the structure would be relatively inoperative for common utilities. Accordingly, the combination of Raether and Kahlbaugh et al. must fail.

In summary, the materials enclosed in Kahlbaugh are depth filtration structures and rely on a mechanism in which the fine fiber material is separated by a separation layer that removes particulate from an air stream. The Raether reference discloses virtually nothing about its filtration media and simply discusses a filter assembly that can be used to filter particulates from an air stream. At most, Raether discloses that the media can be a "paper filter." Paper filter media are surface loading media, not depth loading media, and operate using a very different filtration mechanism. Because of the differences between the structure and operation of these media, one of ordinary skill in the art would not select a media from Kahlbaugh et al. for use in the Raether structure.

In somewhat greater detail, on pages 3 and 4 of the Action, the Examiner admits as follows:

> Raether does not disclose the pleated filter media composite including a substrate, the substrate having ... certain specific filtration parameters.

Nor does Raether disclose a substrate having a fine fiber structure having particular filtration characteristics. As discussed above, Raether, at Column 4, lines 26 through 35, teaches media generally and claims paper media in claim 17. The disclosure of rather is that only that a paper filter can be used in the Raether structure. The Examiner then makes the logical leap that one of ordinary skill in the art would insert the Kahlbaugh et al. material for the paper filter in the Raether reference. Since Raether is completely silent as to the filtration parameters useful in the Raether structure, Applicants assert that one cannot select a media other than a paper media with any reasonable basis and obviousness. Further, the complex Kahlbaugh et al. structure would

not be apparently useful in the Raether reference, since Raether uses a surface loading media whereas Kahlbaugh et al. is a depth loading media designed for different applications.

The Examiner further argues that it would be obvious to combine the media of Kahlbaugh et al. in the structure of Raether to obtain greater life time at a given efficiency and flow rate as suggested in Kahlbaugh et al. Applicants assert that this combination is not logical. The Raether structure is a structure that uses a paper filter that is renewed by pulse cleaning the accumulated filter cake from the paper media. In this way, the filter is returned to a relatively new state and condition; however, in such surface loading structures, the filter cake is accumulated for the purpose of increasing filtration properties. In sharp contrast, efficiency flow rate and life time in the Kahlbaugh et al. reference is obtained by building the Kahlbaugh et al. structure having multiple fine fiber layers separated by a substrate layer. Since life time efficiency and flow rates are obtained in these filter structures using extraordinarily different design concepts, one would not select the Kahlbaugh et al. media to improve the Raether structure in place of the paper filter.

On pages 4 and 5, the Examiner argues that the material selected for the fine fiber would display heat and humidity stability. Applicants assert that claims 13, 14 and 26-31 of the application recites an improved nylon based material having a blend of polymers, a blend of nylon polymers and an additive material that in concert provides surprising and unusual properties of temperature and humidity stability in comparison to the older nylon fibers as shown in the Kahlbaugh et al. reference.

In paragraph 4 of the rejection, the Examiner has rejected claims 9 and 35 under 35 U.S.C. § 103(a) over Raether and Kahlbaugh et al. as above, and further in view of Emig et al., U.S. Patent No. 6,395,046. Emig et al. are relied on as showing specific water soluble polymers recited in the rejected claims. Applicants respectfully traverse the rejection.

First, Emig et al. disclose a vacuum cleaner bag structure in which vacuum cleaner stream of air and particulate enters the bag, contacts the fine fiber for surface filtration purposes and then the air stream exits the bag after filtration is complete. Emig et al. are an unique vacuum cleaner filter; very different than the Raether structure and very different than the Kahlbaugh et al. structure. The Raether structure is a pleated paper media in a rigid element in a cabinet housing. Raether is a surface loading filter having, at most, a paper element. As discussed above, Kahlbaugh et al. is a depth media having multiple layers of fine fiber separated

by a non-filtration separation layer. Lastly, Emig et al. is a vacuum cleaner bag having a layer of a nanofiber tissue inside a flexible bag. All these structures are extraordinarily different in structure and mechanism and cannot logically be combined to obtain a filtration with any reason for combining these references. Further, even if combined, one of ordinary skill has little reason to believe that such a combination would succeed, since the various elements of the layers are extraordinarily different in design and mechanism. Accordingly, it would not be obvious to select a polyvinylalcohol or polyurethane fiber from Emig et al. for use in the media of Raether or Kahlbaugh et al. Applicants assert that the important question is whether the fiber of Emig et al. would be obvious for use in the structure of Kahlbaugh et al. Applicants assert that this is not obvious, since the Kahlbaugh et al. reference as disclosed above is a depth media whereas Emig et al. is a surface loading vacuum cleaner bag.

Applicants assert that they have demonstrated that the combination of Raether and Kahlbaugh et al. is not logical, would not be made by one of ordinary skill in the art, does not lead to a structure that has any reasonable expectation of success and is not logical. Accordingly, claim 1 and 32 upon which claims 9 and 35 depend, are allowable and since these claims are allowable, claims 9 and 35 are also allowable.

Further, Applicants assert that the invention was made prior to the filing date of the Emig et al. reference. Applicants will complete this file by filing a declaration demonstrating the conception and reduction to practice of at least as much of the invention as shown in Emig et al. prior to the filing date of the reference.

On page 8, paragraph 5, the Examiner rejects claims 50-55 under 35 U.S.C. § 103(a) over Raether in view of Kahlbaugh et al. using a similar rationale as is found in paragraph 2. As a whole, the Examiner argues that it is obvious to take the media of Kahlbaugh et al. and place it in the element of Raether and use that structure in a method of filtration. The rejection is substantially the same as that made in the rejections of claims 1-8 and 45-49. Applicants respectfully traverse.

Applicants assert that they have demonstrated above that combining the Kahlbaugh et al. media in the structure of Raether is simply not obvious, since they are not logically combined and there is simply no reasonable expectation of success from the combination. As such, the method claims 50-55 are allowable in light of the same reasons the filtration structure is

allowable. Applicants incorporate by reference the arguments made in response to the rejections of claims 1-8 and 45-49.

Applicants thank the Examiner for the communication that claims 10-32 and 36-44 are allowable if rewritten independently. However, Applicants believe that additional claims are also allowable and should be indicated as such in the next Action.

Respectfully submitted,

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